Instruction Manual 63TM
TM1000 “BIG TIG”
Revised 06/2015

D/F MACHINE SPECIALTIES, INC.

MIG & TIG Welding Products, Consumables & Accessories

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WATER-COOLED “BIG TIG” MACHINE BARREL

Model TM1000

INSTRUCTION, PARTS & SPECIFICATIONS MANUAL

D/F MACHINE SPECIALTIES is a world leader in the design, development, and manufacture of “MIG” (GMAW) & “TIG” (GTAW) welding products, consumables and accessories. D/F offers several types of manual Air or Water-Cooled “MIG” welding tools, and with the increased use of automated and robotic welding systems, a demand has been created for welding tools of the highest quality, durability and interchangeability. For over forty years, D/F welding products have been used extensively on “MIG” and “TIG” welding applications. This experience, coupled with patented design features, unavailable on any other competitive equipment, has made D/F welding tools the most advanced “MIG” and “TIG” welding guns and barrels for semi-automatic, automatic or robotic welding applications.

This Catalog is a guide to helping you select the proper tool for a given semi-automatic, automatic or robotic welding application. The following is only a partial listing of available semi-automatic, automatic and robotic guns. For further information on special “MIG” and “TIG” requirements, please consult the factory.

Customer satisfaction and customer benefits are the center points of all strategic contents

The spirit of the D/F Machine Specialties personnel is to listen to and to integrate the customer throughout the process, to develop and design marketable products, to present prototypes, to carry out pilot tests and to prepare for and be open to new technology and tasks. We attract and carefully select talented individuals who share our values. Together we will nurture and sustain a work environment with two-way communication, training, mentoring, and rewarding career opportunities.

Innovation and quality

Innovation and quality come from being receptive and willing to learn from others. We encourage our people to be creative and take risks in the pursuit of excellence. Innovative practices are deeply rooted in every one of our employees, a philosophy that leads to continuous product development and industry firsts.

Progress

By remaining confident, focused, and persistent in challenging times, we will discover opportunity. Commitment to quality and the pursuit on innovation ensure that D/F Machine Specialties will remain an industry leader for years to come.

Commitment to excellence

At D/F Machine Specialties we commit to design, build and deliver premium products and superior customer support to quality driven welding professionals. Customers still to this day choose D/F over competitors because of our responsiveness and flexibility. Customers will continue to choose D/F tomorrow for our superior hand-made products and service. To ensure this, we need creative and competent personnel in all business divisions, an intensive exchange of thoughts and ideas with all users, participation in working and study groups within the field of welding technology and intensive cooperation with institutes and universities.

Teamwork

Striving for excellence is a commitment that is an integral component of the D/F Culture. Our team of skilled and dedicated employees takes pride in the excellence products they produce. Each of us willingly accepts personal responsibility for meeting our commitments and we hold each other to a high standard of accountability.

Responsibility

We will continually strive to be environmentally responsible and to support the health and safety of our employees, customers, and neighbors. We continue to support the communities in which we operate and the industries in which we participate.

Thank You for Choosing D/F Machine Specialties

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SAFETY MEASURES - **PLEASE READ!**

Welding is not particularly hazardous when certain safety practices are followed. Anyone using this equipment should be thoroughly trained in safe welding practices. Failure to observe safe practices may cause serious injury. Handling welding torches presents no danger if the appropriate safety regulations are strictly adhered to. For example:

• Starting-up procedures must be reserved for those fully conversant with processes relating to arc welding equipment.
• Arc welding can prove damaging to eyes, skin, and hearing! It is therefore imperative that the Accident Prevention Regulations UVV 26.0 and VGB 15 are fully observed and that all protective clothing, eye and ear protectors specified are worn.
• The load data given are maximum limit figures. Overloading will inevitably damage the torch!
• Before changing wear parts, disconnect for the power supply.
• The operating instructions for the individual welding components - e.g. power source, wire feed and cooling unit must be followed.
• Never pull the cable assembly across sharp edges or set down close to weld spatter or on a hot workpiece.
• Those not involved in the welding process should be protected by curtains or partitions from radiation and the danger of being dazzled.
• When handling gas cylinders, consult the instructions issued by the manufacturers and the suppliers of the pressurized gas.
• Workpieces which have been degreased using chlorinated solvents must be sprayed down with clean water before welding starts to avoid the risk of phosgene forming. For the same reason, no degreasing baths containing chlorine must be placed close to the welding point.
• All vapors given off by metals can cause harm and a special warning is attached to lead, cadmium, copper, zinc, and beryllium. If necessary, take appropriate precautions (by providing adequate ventilation or an extraction system) to ensure that the legal maximum levels of toxic concentrations are not exceeded.

For more information, refer to the following standards in their latest revisions and comply as applicable.

• ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.
• ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY - TOE FOOTWEAR obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
• ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
• OSHA, SAFETY AND HEALTH STANDARDS, 29CRF 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
• AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTABLES obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.
• NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
• ANSI Standard Z88.2, "Practice for Respiratory Protection" obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
• ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION obtainable from the American National Standards Institute, 1430 Broadway, New York, NY, 10018.
• NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING obtainable from the Superintendent of Documents, U.S. Printing Office, Washington, D.C. 20402.
• American Welding Society Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", obtainable from the American Welding Society, 2501 N.W. 7th St., Miami, FL 33125.

IMPORTANT

The D/F torch is famous for the fact that if it is chilled properly, the welder can grab the front of the torch with their bare hand and it will be cold to the touch seconds after welding. With the proper chiller, this can be done even after a 4 hour arc time.

Make certain the cooling water supply is at least the minimum flow rate of 1 gallon per minute (for each inner body), at 40 psi (80 psi maximum) with a 5 gallon reservoir and 15,000 BTU/hr cooling capacity. Gun ratings are affected by shielding gas used, arc time, cooling time and inlet water temperature. Water outlet temperature should not exceed 27°C (80°F). The torch's water out & power cable is not cooled until the coolant has gone through the torch and out the water out & power cable. If water is not flowing through the D/F torch for at least 1 minute prior to striking an arc, when you apply the power and water hits the "hot" water/out & power cable, you will generate steam. Steam can damage the torches internals in seconds causing a leak. It can also blow out the torches water/out & power cable. A flow switch can be installed after the return line ensuring that coolant is present at the return line prior to striking an arc.

When High-Deposition GMAW or extended periods of arc time are used, it is recommended that a liquid chiller be considered with a larger reservoir and a minimum of 30,000 BTU/hr cooling capacity. Precise temperature control maintains the cooling at a constant 13°C (55°F) temperature, thus prolonging the life of the welding equipment and more specifically extending the service life of the gas nozzle and current tip.

A refrigerated liquid chiller for GMAW may be obtained from:

For single torch chillers: Dynaflux - 800-334-4420 - www.dynaflux.com

For multiple torch cooling systems: Koolant Koolers - 800-968-5665 - www.koolantkoolers.com

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INTRODUCTION

The high current water cooled TIG barrel is of a design which offers the capability of operating at current levels of 1000 amperes.

Tungsten diameters accommodated by the barrel range from 1/8” thru 3/8” diameters.

A unique feature of this Water-Cooled Machine Barrel is that the nozzle assembly water chamber and inner body water chamber are serially connected to each other with removable connectors making it a relatively simple matter to detach the nozzle assembly, thus completely eliminating the need for gaskets or o-rings in the water passage system.

For further information or help with D/F Machine Specialties products, please visit our web site at www.dfmachinespecialties.com, or consult the factory at 1-507-625-6200.

DISASSEMBLY

To disassembly the Water-Cooled Barrel, proceed as follows:

1) Remove the forward gas nozzle.

2) Unscrew the collet adapter (D/F #15914) with wrench supplied. Remove the insulating tube (D/F #15879) and gas diffuser (D/F #15858).

3) Remove the body nut.

4) With a screw driver remove the barrel body holding screws. The upper shell may bow be removed from the barrel body.

5) Push the barrel body upward until it bottoms out at service connections. The nylon insulators at the front water hose fittings are now exposed. Push these into the barrel body concaves which will expose the interconnection water hose fittings. Pull the water-cooled nozzle assembly forward (approx. 1/4”) while supporting the barrel body and inner body assembly. This will extend the fixed interconnection hose to its full length. With a 7/16” open end wrench, unscrew the water hose nuts from the water-cooled nozzle body. The water-cooled nozzle may now be removed from the inner body assembly. Following this the barrel body may be removed from the inner body.

6) Part replacement may now be performed.

ASSEMBLY

1) To assemble the water-cooled barrel, attach the short interconnection hose assemble to the upper block of the inner body. Connect the long interconnection hose to the fitting at the rear of the front inner body block. It is recommended that at this point a leak test be made by attaching the interconnection hose fittings to the water-cooled nozzle. Apply a water hose to one of the service connections made within the inner body assembly.

2) Place the long interconnection hose into the concave of the inner body with it extending outward form the inner body. Place the inner body assembly into the barrel body until it bottoms out at service connections.

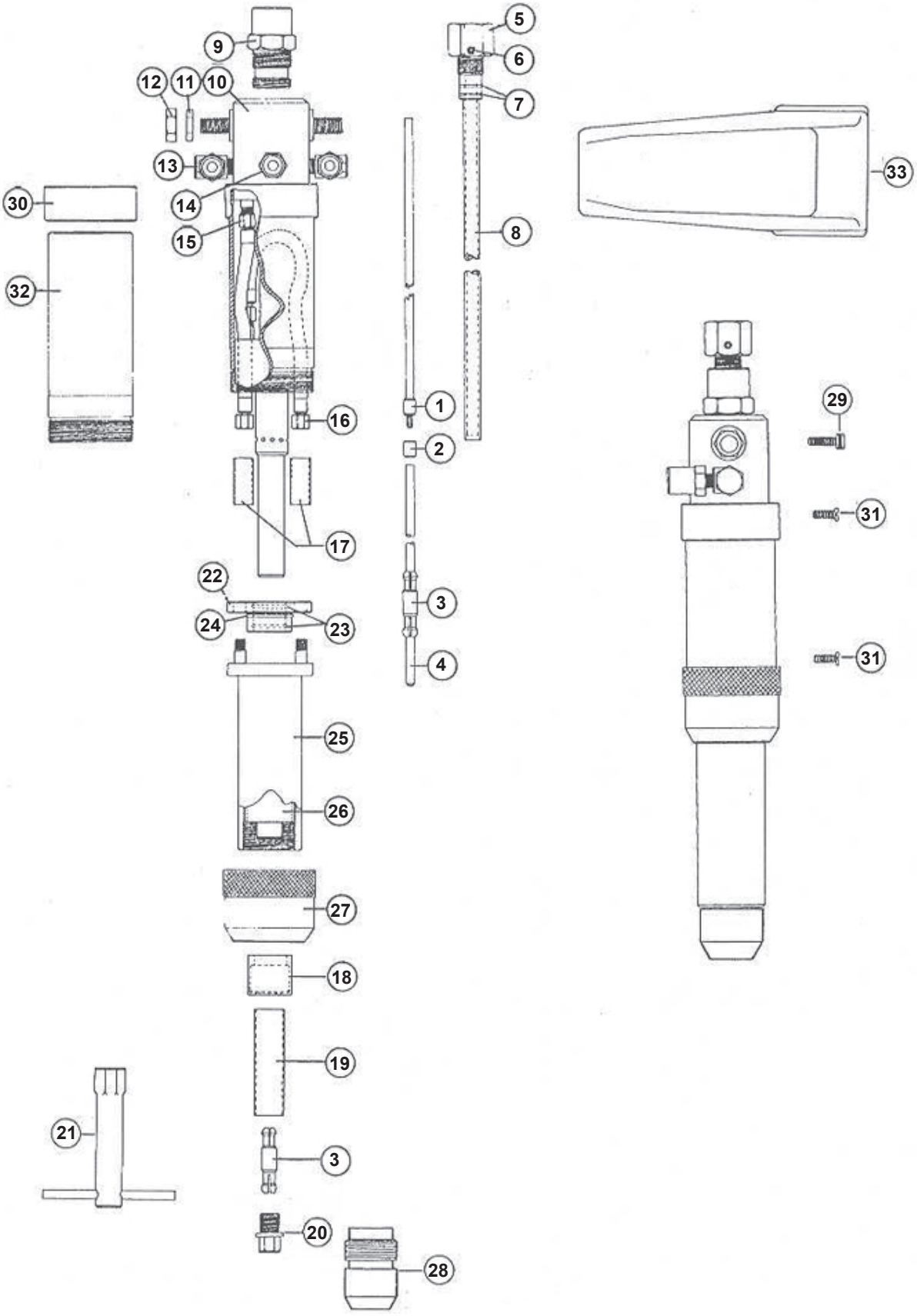
3) Insert the two (2) nylon insulating collars over the interconnection hose fittings.

4) The nylon collar should be in place on the rear of the water-cooled nozzle assembly. It is important that the small hole in the nylon collar be on the lower right hand side as the water-cooled nozzle is connected to the hose fittings. After fastening the hoses, the barrel body should be moved forward until the flat head body screw may be fastened. The water-cooled nozzle may now be pushed back against the barrel body.

5) Slide the upper barrel body shell into place and fasten with the screw. The body nut may now be applied.

6) Place the gas diffuser (D/F #15858) with parts facing forward on the inner body. Replace insulation tube (D/F #15879) and apply collet adapter (D/F 15914) with wrench supplied.

WATER-COOLED TIG BARREL - PARTS
"BIG TIG" MODEL TM1000



WATER-COOLED TIG BARREL - PARTS (CONTINUED)
"BIG TIG" MODEL TM1000

REF.	CODE NO.	DESCRIPTION
1	15849	Tungsten Extension Rod Assembly
2	15804	Tungsten Sleeve 1/8"
	15805	Tungsten Sleeve 5/32"
	15806	Tungsten Sleeve 3/16"
	15807	Tungsten Sleeve 1/4"
	15808	Tungsten Sleeve 5/16"
	15809	Tungsten Sleeve 3/8"
3	15811	Collet 1/8"
	15812	Collet 5/32"
	15813	Collet 3/16"
	15814	Collet 1/4"
	15815	Collet 5/16"
	15816	Collet 3/8"
4	15821	2% Thoriated Tungsten Electrode (5/16" Diameter)
	15822	2% Thoriated Tungsten Electrode (3/8" Diameter)
	15827	Zirconium Tungsten Electrode (5/16" Diameter)
	15828	Zirconium Tungsten Electrode (3/8" Diameter)
5	15851	Knob
6	12578	Socket Set Screw
7	13918	O-ring
8	15838	Top Load Shaft Assembly (with knob)
	15839	Top Load Shaft Assembly (less knob)
9	15834	Adapter
10	14033	Inner Body
11	14322	Washer (2 required)

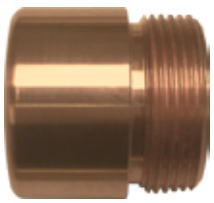
REF.	CODE NO.	DESCRIPTION
12	14336	Nut (2 required)
13	16040	Elbow - Water/Gas
14	14555	Water L.H. Adapter (2 required)
	14556	Gas R.H. Adapter
15	10972	Hose Assembly - Short
16	10971	Hose Assembly - Long
17	10725	Insulating Tube (2 required)
18	15858	Gas Diffuser
19	15879	Insulation Tube - Inner Body
20	15914-.188	Collet Adapter 3/16"
	15914-.250	Collet Adapter 1/4"
	15914-.313	Collet Adapter 5/16"
	15914	Collet Adapter 3/8"
21	12115	Wrench
22	10743	Insulating Collar (includes o-rings)
23	13913	O-ring - Internal (2 required)
24	13914	O-ring - External
25	11123	Water-Cooled Nozzle
26	15913	Insulating Sleeve
27	10249	Nut
28	15876	Gas Nozzle (see Table 1 below)
29	14258	Socket Cap Screw
30	13990	Outer Top Shell
31	12614	Flat Head Screw (2 required)
32	14041	Barrel Housing
33	14052	Boot

TABLE 1 - GAS NOZZLES

Ref.	Code No.	Type	O.D.	I.D.
1	15921	Ceramic	1-5/8"	11/16"
	15922	Ceramic	1-5/8"	13/16"
	15923	Ceramic	1-5/8"	1"
2	10387	Copper	1-5/8"	1"
	10392	Copper	1-5/8"	3/4"
3	10389	Copper	1-5/8"	1-1/4"
4	10390	Copper	2"	1-1/4"

1

2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4

REQUIRED TOOLS LIST FOR DISASSEMBLY & ASSEMBLY

1. **D/F 12111 Collet/Tip Wrench** - This is the only tool that should ever be used to tighten the collet nut or the tip. Pressure should be 30 lbs., or as snug as hand tightened. Never use another wrench to apply more torque to this wrench.

2. **D/F 14611 Nozzle Thread Chaser Tap** - This is used to re-tap damaged threads that have been improperly cleaned or cross threaded. Always blow out the nozzle and gas nozzle after changing gas cup or re-tapping. For more information on how to use the nozzle thread chaser tap, use the following link: www.dfmachine.com/taps

3. **D/F 12114 Tip Adapter Nut Wrench** - This is the only tool that should ever be used to tighten the tip adapter nut. Pressure should be 30 lbs., or as snug as hand tightened. Never use another wrench to apply more torque to this wrench.

4. **Long 7/16" Open Ended Wrench**
   A. A short wrench will work, however we prefer the feel and comfort of the long 7/16" open ended wrench. This is used to loosen or tighten interconnection hoses to the fitting on the inner body.
   B. Also use this wrench to connect the torch's water-cooled nozzle assembly to the interconnection hoses.

5. **11/16" & 3/4" Open Ended Wrench**
   A. The 3/4" Open Ended Wrench is used on the inner body's water in and gas elbow fittings to secure them to the torch's inner body. A crescent wrench could be used instead, but due to the large size of crescent wrenches, we prefer the smaller size of the open ended wrenches. You never want to use excessive force by using too large of a wrench. You will also use the 3/4" Open Ended Wrench to secure the water in and gas adapters to the elbows, and the water out adapter to the inner body.
   B. The 11/16" Open Ended Wrench is used to secure the gas hose and water in/water out & power cables or hoses to the torch's inner body.
   C. The 3/4" Open Ended Wrench is also used to secure the adapter and jam nut that hold the tip adapter nut which holds the current tip in the inner body. In your left hand hold the inner body, and with your right hand thread up the adapter using the 3/4" Open Ended Wrench until it is tight. Now place the same wrench on the jam nut and snug it up against the inner body. Keeping that wrench on the jam nut and placing it on the table for force, take another 3/4" Open Ended Wrench, place it on the adapter and push it down (counter-clockwise) securing the adapter to the inner body.

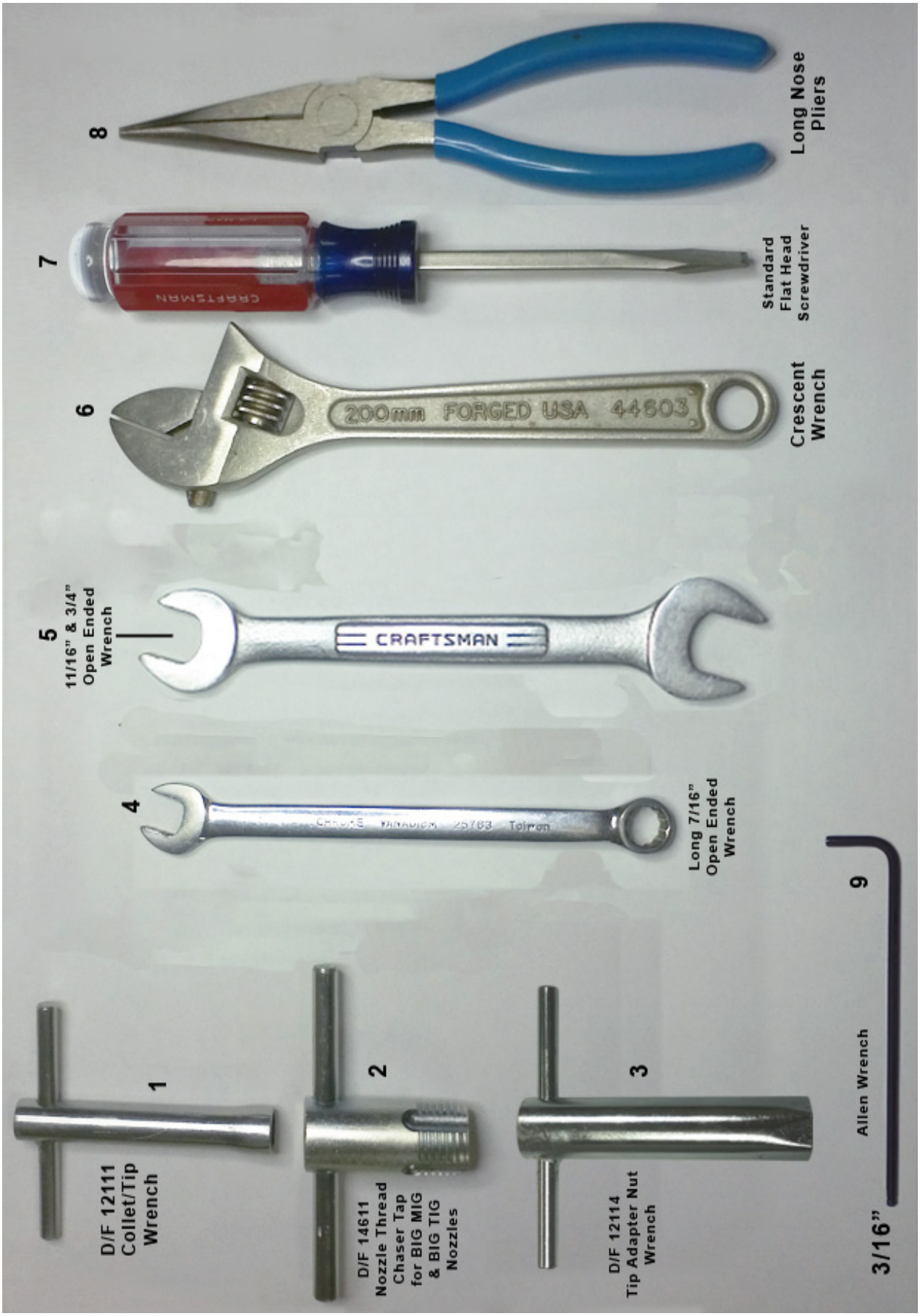
6. **Adjustable Crescent Wrench** - A medium size adjustable crescent wrench could be used as well. We prefer the use of the larger wrenches on the power cable fitting to ensure that there are no water leaks, and that it has been seated correctly. **CAUTION:** Never use excessive force with large wrenches, for you could twist or break parts.

7. **Standard Flat Head Screwdriver** - This is used to tighten or secure the torch's body screw. Also, the screwdriver can be used to straighten the contact tip if it is not aligned in the center of the gas cup or water-cooled nozzle **CAUTION:** This cannot be done unless the spatter disc has been removed from the torch.

8. **Long Nose Pliers** - These are used to grab the small white insulation tubes (10725) and get them into the correct position when working on the interconnection hose fittings inside the torch. Also they are very handy when changing a slip-in contact tip.

9. **3/16" Allen Wrench** - This is used to secure the socket cap screw that holds the casing adapter in the inner body. It is also used to secure the socket cap screw that holds the casing in the casing adapter.

REQUIRED TOOLS LIST FOR DISASSEMBLY & ASSEMBLY



WHAT IS THE PROPER USE OF THE NOZZLE THREAD CHASER TAP?

All D/F Nozzles are hand checked for fit before and after plating, and checked again before shipping. If a nozzle has been installed on a new complete torch, they have also been hand checked while being assembled.

The only reason to ever take a gas cup out a nozzle is to clean it. The nozzle and the gas cup must be blown out, and all of the threads have to be wire brushed and blown out again before hand-tightening the gas cup back into the nozzle. If you can't thread it in by hand then something is wrong. Never force a gas cup into a nozzle.

When using the D/F Machine Specialties nozzle thread chaser taps, be sure to always follow the steps below:

1. Make sure that the nozzle is properly supported when tapping so it does not twist in the front of the torch body and cause damage.
   - Improper support can cause the spigots to twist off the top of the rear nozzle collar, or damage the torch internal body parts.
   - Note where the water ports go down the sides of the water-cooled nozzle (following down in line with the spigots). Too much direct pressure on these water ports could cause them to cave in and block of the flow of water.
   - Best practice is to hold the water-cooled nozzle in a vice with soft jaws, perpendicular to the spigots.
   - Over-tightening of the vice can cause damage in general.

2. Remove the tip from the front of the torch before tapping.

3. Lightly lubricate the nozzle and nozzle thread chaser tap before tapping.

4. Be sure to start the tap very carefully. Do not cross thread the nozzle.

5. Be very careful to start threads correctly. Only tap 1/2 turn at a time, always backing up and removing chips 1/2 cycle at a time before moving forward. Do not try to tap further into the water-cooled nozzle than needed or past the factory thread depth.

6. Blow out the nozzle after tapping. Wire brush and blow off the gas cup before threading it back into the nozzle.

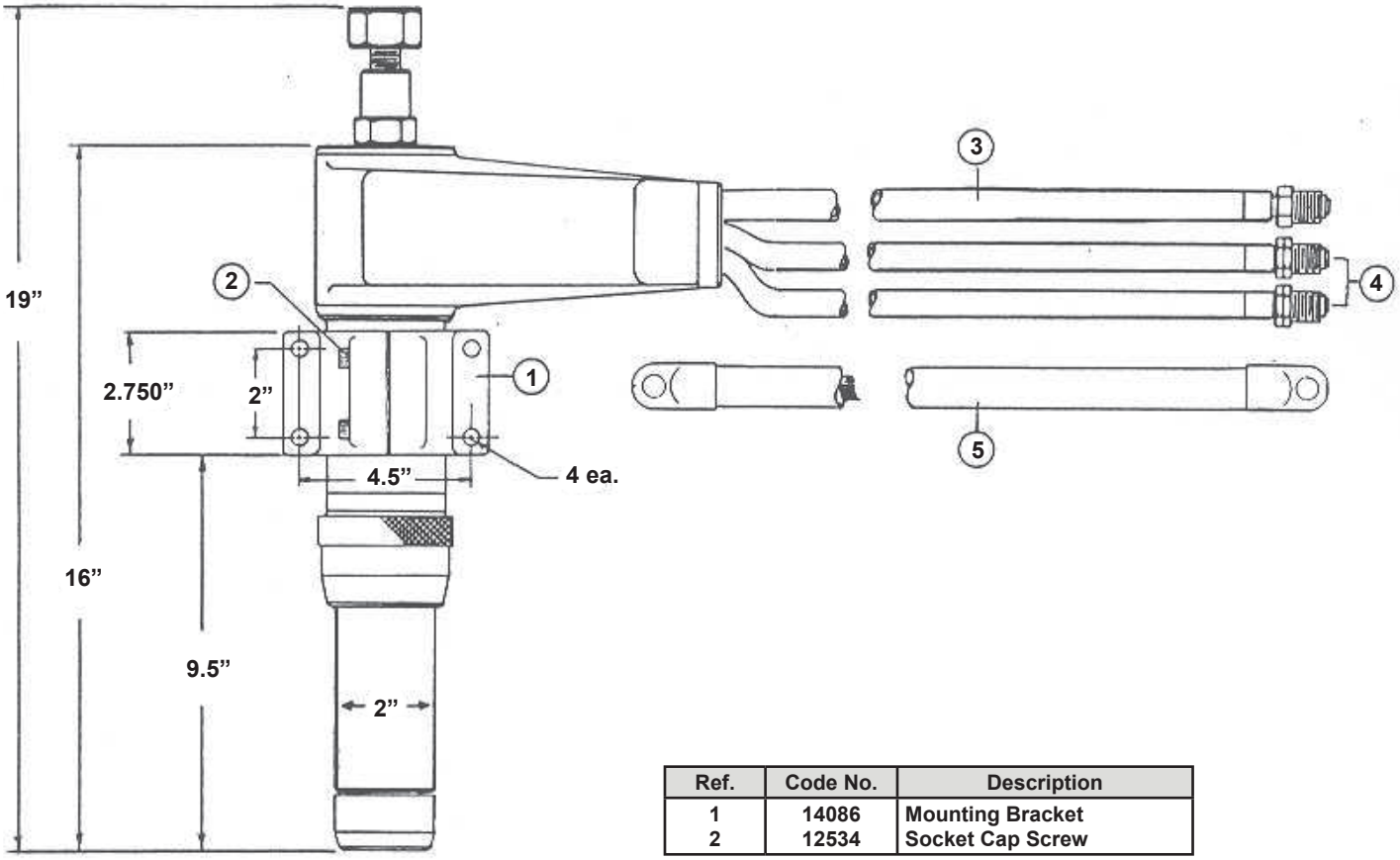
7. If nozzle is badly deformed or damaged please return to the factory for a repair estimate before disposing of product (damaged parts can often be repaired).

ORDERING INFORMATION - NOZZLE THREAD CHASER TAPS

CODE NO.	DESCRIPTION	USED WITH NOZZLE ASSEMBLY	USED FOR GAS NOZZLE
14610	Nozzle Thread Chaser Tap for Standard A/C & W/C Nozzle Assembly Front	13197 16184 11117, 45101 11118, 45102 11119, 45103 45114 45107 NCC-N/HTC-N NCC-LRN, HTC-LRN	10340 10359 10362 10374
14611	Nozzle Thread Chaser Tap for BIG MIG & BIG TIG Nozzle Assembly Front	11123	10382 10387 10389 10390 10392
14612	Nozzle Thread Chaser Tap for Nozzle Body Assembly Rear	13196 13197 13198 16184	
14614	Nozzle Thread Chaser Tap for Series A High-Capacity Nozzle Assembly Front	11142, 45120 11138, 45121 45127 11132, 45129 45125	16748 16749 16750 16751 18030 18031 18032
14615	Nozzle Thread Chaser Tap for Nozzle Body Assembly Front	13198	10379
14617	Nozzle Thread Chaser Tap for Tandem Nozzle Assembly Front	41641	41667 41668

TM1000 MACHINE BARREL MOUNTING

CODE NO.	DESCRIPTION	TUNGSTEN SIZE	CURRENT CAPACITY	MODEL
15203	3 Ft. Assembly	1/8”-3/8”	1000	TM103
15204	4 Ft. Assembly	1/8”-3/8”	1000	TM104
15206	6 Ft. Assembly	1/8”-3/8”	1000	TM105
15208	8 Ft. Assembly	1/8”-3/8”	1000	TM106
15210	10 Ft. Assembly	1/8”-3/8”	1000	TM107



Ref.	Code No.	Description
1	14086	Mounting Bracket
2	12534	Socket Cap Screw

Ref.	Description	2 Ft.	3 Ft.	4 Ft.	5 Ft.	6 Ft.	8 Ft.	10 Ft.	12 Ft.	15 Ft.
3	Gas Hose Assembly 3/8” Hose	16575-2	16575-3	16575-4	-5	6	-8	-10	-12	-15
4	Power Cable 2/0	15263-2	15263-3	15263-4	-5	-6	-8	-10	-12	-15
	Power Cable 4/0	15270-2	15270-3	15270-4	-5	-6	-8	-10	-12	-15
5	Water In/Out & Power Cable Assy L.H. Nut Each End	19645-2	19645-3	19645-4	-5	-6	-8	-10	-12	-15

Consult factory for other cable lengths required.

INSTALLATION OF THE TUNGSTEN EXTENSION ROD

The Tungsten Extension Rod (page 6-7, Ref. 1) permits top loading of .040” through 5/32” diameter tungsten electrodes. It consists of a phenolic rod which provides a threaded stud at its lower end. A tungsten sleeve (ref. 2) must be low temperature brazed to the end of the tungsten that will be used. Apply this tungsten electrode with brazed sleeve to the threaded stud provided on the Tungsten Extension Rod (ref. 1). Slide the proper collet (ref. 3) on the tungsten for a distance of approximately 2”.

This assembly consisting of the Extension Rod, Tungsten and Collet is now ready to be applied to the “TIG” barrel. Proceed by unscrewing the Top Load Shaft (ref. 8) and remove it from the barrel. Next apply the Tungsten Extension Rod assembly by sliding it up through the Top Load Shaft from the bottom of the Shaft. Grip the Tungsten Extension Rod above the Knob on the Top Load Shaft and replace this combination into the “TIG” barrel. After the Top Load Shaft has been threaded for several revolutions the tungsten may be adjusted upward or downward by the use of the Tungsten Extension Rod extending beyond the Shaft Knob. The desired stickout of the tungsten electrode at the gas nozzle may now be set after which the shaft knob my be firmly tightened.

Since the tungsten erodes during welding the Top Load Shaft in combination with the Tungsten Extension Rod allows adjustment during the weld cycle. This may be accomplished by releasing the Top Load Shaft only enough to remove pressure from the Collet after which the Tungsten Extension Rod may be moved downward to compensate for electrode erosion. This procedure may be repeated until the length of tungsten has been consumed.

A quantity of tungsten should be prepared with the sleeves applied so that a new electrode may be applied with minimum downtime.

TABLE 2 - RECOMMENDED SPARE PARTS

ITEM	CODE NO.	MIN QTY.
Gas Nozzle	To Be Selected	1
Tungsten Sleeve	To Be Selected	1
Collet	To Be Selected	1
Gas Diffuser	15858	1
Insulation Tube	15879	1

UTILITY STATION 45188 - DUAL POWER

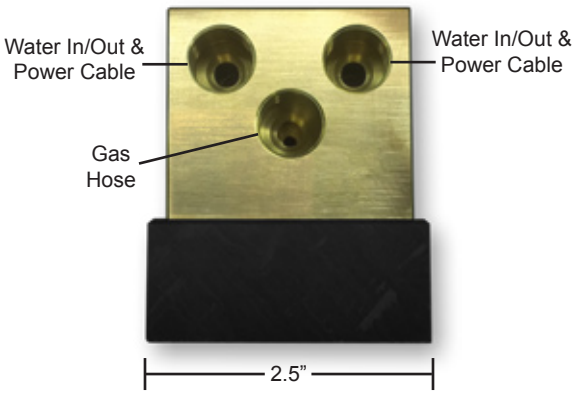
ORDERING INFORMATION

Description	Code No.
Utility Station	45196
Utility Station - Dual Power Cable	45188

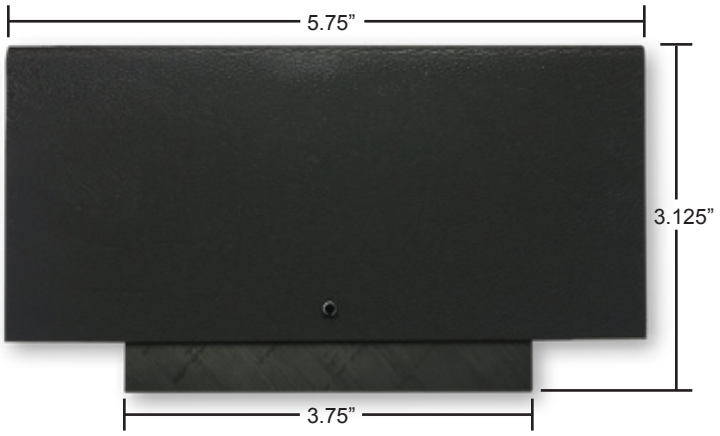
DIMENSION SPECIFICATIONS

Base Length	3.75”
Overall Length	5.75”
Base Width	2.25”
Overall Width	2.5”
Overall Height	3.125”
Mounting Hole Center Distance	2.75”
Overall Weight	3.5 lbs.

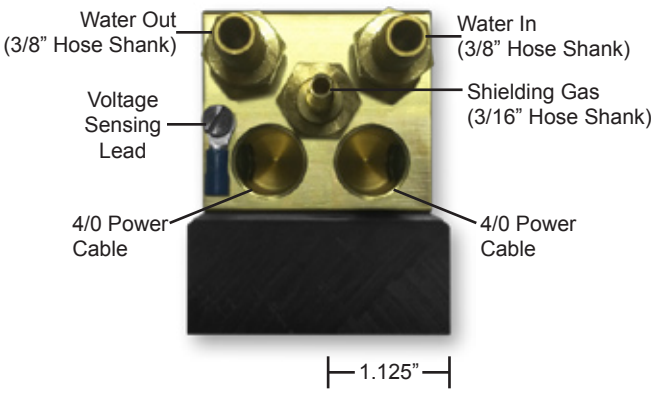
D/F TORCH CONNECTION



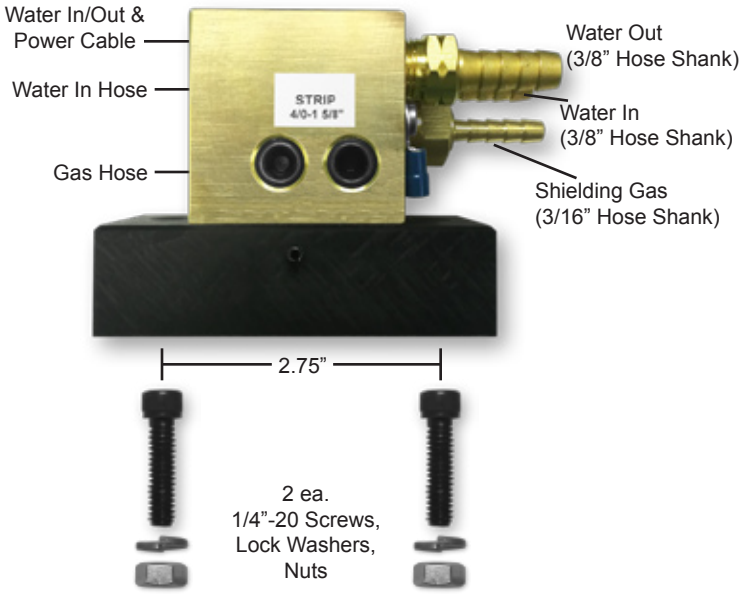
UTILITY STATION SIDE VIEW WITH COVER



CUSTOMER UTILITIES CONNECTION



FROM LEFT: D/F TORCH CONNECTION
FROM RIGHT: CUSTOMER UTILITIES CONNECTION


Water In/Out & Power Cable
Water In Hose
Gas Hose
Water Out (3/8” Hose Shank)
Water In (3/8” Hose Shank)
Shielding Gas (3/16” Hose Shank)
STRIP 4/0-1 5/8”
2.75”
2 ea. 1/4”-20 Screws, Lock Washers, Nuts

TROUBLESHOOTING: POROSITY (SUMMARY)

NOTE: Most POROSITY is caused by gas problems, followed by base metal contamination.

Causes of Porosity	Possible Solutions
BASE METAL CONTAMINATION	
Impurities on base metal	a. Remove contamination; clean surfaces b. Use of specific wire/gas mix for specific types of impurities
FILLER METAL CONTAMINATION	
Impurities on filler metal (wire)	a. Replace wire b. Install wire-cleaning system c. Prevent industrial dust/dirt/grit from contaminating wire during storage or use d. Prevent build-up of aluminum oxide on exposed aluminum wire surface by using up quickly e. Remove wire from wire drive unit and store in a sealed plastic bag when not in use for long periods
ATMOSPHERIC CONTAMINATION	
Drafts, wind, fans, etc.	a. Protect weld from drafts (curtains/screens) b. Use tapered or bottleneck gas nozzles when drafts cannot be avoided
GAS MIXING APPARATUS	
1. Too high a gas flow, causing turbulence, and/or sucking air at hose connections; creating the venturi effect at end of gas nozzle	1a. Reduce gas flow 1b. Tighten all hose connection points
2. Too low a gas flow, causing insufficient gas coverage	2. Increase gas flow
3. Damaged or kinked gas lines	3. Repair or replace
4. Too high an oxygen content	4. Adjust mixer
5. Leaks in gas distribution system	5. Repair leaks
6. Other impurities in gas - moisture, etc.	6. Overhaul system; fit filters and/or dryers
7. Inconsistent gas flow (cfh) at the torch connection	7. Regulate pressure into flow meter for consistent cfh delivery of gas
GAS TURBULENCE	
1. Excessive spatter build-up in gas nozzle and on current tip	1. Clean nozzle and tip regularly; spray with anti-spatter fluid
2. Nozzle damage, causing uneven gas coverage	2. Replace nozzle
3. Torch gas ports clogged or deformed	3. Clean or replace
4. Super-heated nozzle, causing shielding gas to expand rapidly and create return effect at end of nozzle	4. Check duty cycle rating of torch
5.Gas diffuser/nozzle insulator missing	5. Replace
6. Too high a gas flow causing the venturi effect	6. Reduce gas flow
WELDING PARAMETERS, ETC.	
1. Too long a wire stick-out; gas nozzle too far from weld puddle	1. Use longer nozzle or adjust stick-out (3/8” minimum or 15 times wire diameter)
2. Bad torch position - too sharp a torch incline causing the venturi effect at the end of the nozzle leading to atmospheric contamination	2. Correct torch angle
3. Excessively wide weld pool for nozzle I.D.	3. Width of the weld pool should be 1.3 times the nozzle I.D.; use suitable wider gas nozzle
4. Arc voltage too high	4. Reduce voltage
5. Too high a travel speed	5. Reduce speed

TROUBLESHOOTING: SPATTER

Problems/Causes	Possible Solutions
SPATTER Too fast or too slow wire feed for the arc voltage	Set the wire feed rate and voltage in accordance with good welding practices as recommended by a qualified welding engineer.
Too long an arc	Adjust the wire feed and voltage so that the arc is in accordance with good welding practice for the joint to be welded. The distance from the current tip to the workpiece should be 15 times the welding wire diameter. If the arc is too long there will be spatter, usually in the direction of the weld.
Damaged current tip	If the current tip becomes worn the welding wire will not be in constant contact with the tip and the arc will become unstable. A current tip contaminated with spatter will cause uneven wire feed resulting in further spatter.
Inclination of welding gun too great	The angle of the gas nozzle relative to the workpiece should be between 45 and 90 degrees. If the angle is too small, the wire runs parallel to the weld pool, resulting in spatter in the direction of the welding.
Faulty power source	Have the power source checked for faulty conditions such as broken wires and faulty contacts.
Incorrect start	A great deal of spatter occurs if the stick-out is too great and if the welding gun is held too far from the workpiece when striking the arc. Try to start with as short a stick-out as possible and with the welding gun as close to the starting point as possible. If a large ball end is formed on the end of the welding wire, remove it by cutting the wire with sharp wire cutters. It is helpful if the wire is cut to a point. Always remove the ball end before striking an aluminum arc. Check the welding ground connection.
Incorrect pulse parameters	Check the user manual for your power supply or consult a qualified welding engineer.
Uneven wire feed	Uneven wire feed gives rise to heavy spatter. Find the cause of the disturbance and correct the condition before proceeding.
Impurities on the base metal	Paint, mill scale, rust and other contamination on the base metal form an insulating layer causing an unstable arc that results in heavy spatter. Clean the surfaces to be welded.
Poor ground contact	Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found and attach the ground cable directly to the workpiece after having cleaned the contact surface first. POOR GROUND CONTACT IS THE MOST COMMON CAUSE OF UNSTABLE MIG WELDING CONDITIONS.
Too long stick-out (short-arc welding)	The stick-out should be 15 times the diameter of the wire electrode being used. With increasing stick-out, the current is reduced and the arc voltage rises, giving a longer unstable arc and increased spatter.
Incorrect polarity	Check for correct polarity. Follow the electrode manufacturer's recommendations.

TROUBLESHOOTING: GENERAL GUIDE

Problems/Causes	Possible Solutions
ERRATIC WIRE FEED	
Slipping feed rolls	Check that the feed roll size is correct for the wire size being used. Increase the drive roll pressure until the wire feed is even. Do not apply excessive pressure as this can damage the wire surface, causing copper coating to loosen from steel wires or metal shavings to be formed from soft wires like aluminum. These metal fragments or shavings can be drawn into the wire feed conduit and will rapidly clog the liner. When welding with flux-cored wires, excessive drive roll pressure may open the wire seam and allow flux or metal powders to escape.
Clogged or worn gun liner	a. Dust, particles of copper, drawing lubricants, metal or flux and other forms of contamination can all clog the liner so that the wire feed is slowed or impeded. A liner that has been in use for an extended period of time becomes worn and filled with dirt and must be replaced. b. When changing the welding wire, remove the tip from the front end of the gun and blow out the body liner with clean, dry compressed air from the back of the gun. Repeat with the casing and liner assembly. Note: Wear safety goggles when using compressed air to clean the liners. Make sure proper safety procedures are followed in order to avoid possible serious eye injury.
Liners too long or too short	Check the lengths of the liners and trim or replace if too long or too short. The efficient feeding of the welding wire is dependent on the liners fitting correctly.
Spatter on the wire	An unprotected coil of wire quickly collects dust and other airborne contamination. If grinding is being performed in the vicinity, particles can become attached to the wire, severely interfering with the wire feed. Replace with clean wire and keep it protected with a cover. Make sure spare wire rolls are stored in a clean, dry place.
Coil brake incorrectly adjusted	Set the brake so that the coil immediately stops rotating as soon as welding is interrupted. If the brake is applied too hard it will cause the feed rolls to slip, resulting in uneven wire feed. If it is too loose, overrun of the wire will occur, causing wire tangles, inconsistent tension on the feed mechanism and irregular arc characteristics.
UNSTABLE ARC	
Incorrect setting of voltage and/or current	Set the wire feed in relation to the arc voltage in such a way that the arc is stable and burns evenly. In spray arc welding, set the wire feed so that there are no short circuits and the filler metal is transferred in a spray across the arc. Find the cause of the interference and correct it. (See ERRATIC WIRE FEED above)
Problems in wire feeding: worn current tip	When the internal diameter of the current tip becomes worn from the passage of wire through it, the wire may no longer stay in continuous electrical contact with the tip. This results in an unstable arc and an increase in spatter. Paint, mill scale, silicon scale, rust or flux deposits from previous weld runs may form an insulating layer causing an unstable arc. Clean the surfaces to be welded.
Impurities on the base metal	Securely attach the ground cable as close to the point of welding as possible on the workpiece. Clean the surfaces thoroughly to ensure good contact.
Poor contact between ground cable and workpiece or loose power connection	Check to insure the welding power connection on the power source is tight, the and workpiece. Connection on the wire feeder is tight, the connection to the adaptor block is tight, Loose power connection and the connection of the gun to the adaptor block is tight.
Stick-out too long	Adjust the current tip to work distance to a minimum of 3/8” for short arc welding. A more precise distance is 15 times the wire diameter.

TROUBLESHOOTING: GENERAL GUIDE

Problems/Causes	Possible Solutions
AIR-COOLED GUN RUNNING TOO HOT	
Poor ground	Inspect ground cable for loose connections, fraying and cuts. Correct any problem areas found. Clean clamping area to insure good contact. Securely attach the ground cable to the workpiece, as close as possible to the point of welding. Make sure there is a good connection to the welding power source.
Loose power connection	Check to make sure the power connection on the power source is tight, the connection on the wire feeder is tight, the connection to the adaptor block is tight, and the connection of the gun to the adaptor block is tight.
Consumable items loose or worn	Remove nozzle from gun and inspect current tip, collet nut (tip holder) and spatter disc (gas diffuser) for wear and tightness; replace or tighten as necessary.
Capacity of gun being exceeded	Note complete weld parameters, including welding current (Amps), welding voltage, wire feed speed, type and size of wire, type of gas and flow rate of gas and consult your local Authorized D/F Machine Specialties Distributor or contact the factory.
Dirty connection	Remove torch and inspect parts for dirt build-up. Periodic cleaning is necessary.

D/F MACHINE SPECIALTIES, INC.

MIG & TIG Welding Products, Consumables & Accessories

WARRANTY

This Equipment is sold by D/F MACHINE SPECIALTIES, Incorporated, under the warranty set forth in the following paragraph. Such warranty is extended only to the buyer who purchases the equipment directly from D/F or its authorized distributor as new merchandise.

The barrel and cable assemblies are warranted by D/F to be free from manufacturing defects for 90 days after delivery by D/F, provided that the equipment is properly operated under conditions of normal use and that regular periodic maintenance and service is performed. Expendable parts are not warranted for any specific time. Expendable parts referred to herein would be the nozzles, current tips, spatter discs, insulators, casing liners, and wire inlets. D/F's sole obligation under this warranty is limited to making replacement at its manufacturing facility for barrel assemblies which are returned to it with transportation charges prepaid, and upon D/F's examination have been found to be so defective.

Genuine D/F MACHINE SPECIALTIES, Inc. Parts, Accessories, and Consumables must be used for safety and performance reasons. The use of anything other than genuine D/F MACHINE SPECIALTIES, Inc. Parts, Accessories, or Consumables will void this Warranty. All units returned for warranty repair are subject to Warranty Inspection. Warranty and repair work shall not apply to goods that have been altered or repaired, have been subject to misuse or used while any parts are loose, broken, or damaged, or used with other than original D/F® parts, consumables, or accessories which may affect performance and safety.

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